



(19)

Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 772 249 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
04.11.1998 Bulletin 1998/45

(51) Int. Cl.⁶: H01L 33/00, H01S 3/19

(43) Date of publication A2:
07.05.1997 Bulletin 1997/19

(21) Application number: 96117792.0

(22) Date of filing: 06-11-1996

(84) Designated Contracting States:
DE FR GB IT NL

(30) Priority: 06.11.1995 JP 287189/95
24.11.1995 JP 305279/95
24.11.1995 JP 305280/95
24.11.1995 JP 305281/95
06.12.1995 JP 317850/95
20.12.1995 JP 332056/95
16.07.1996 JP 186339/96
29.08.1996 JP 228147/96

(71) Applicant:
NICHIA CHEMICAL INDUSTRIES, LTD.
Anan-shi, Tokushima-ken (JP)

(72) Inventors:

- Nakamura, Shuji,
c/o Nichia Chemical Ind., Ltd.
Anan-shi, Tokushima-ken (JP)
 - Nagahama, Shinichi,
c/o Nichia Chemical Ind., Ltd.
Anan-shi, Tokushima-ken (JP)
 - Iwasa, Naruhito,
c/o Nichia Chemical Ind., Ltd.
Anan-shi, Tokushima-ken (JP)

(74) Representative:

**Heusler, Wolfgang, Dipl.-Ing.
Dr. Dieter von Bezold
Dipl.-Ing. Peter Schütz
Dipl.-Ing. Wolfgang Heusler
Briener Strasse 52
80333 München (DE)**

(54) Nitride semiconductor device

(57) A nitride semiconductor device has a nitride semiconductor layer structure. The structure includes an active layer (16) of a quantum well structure containing an indium-containing nitride semiconductor. A first nitride semiconductor layer (101) having a band gap energy larger than that of the active layer (16) is provided in contact with the active layer (16). A second nitride semiconductor layer (102) having a band gap energy smaller than that of the first layer (101) is provided over the first layer (101). Further, a third nitride semiconductor layer (103) having a band gap energy larger than that of the second layer (102) is provided over the second layer (102).

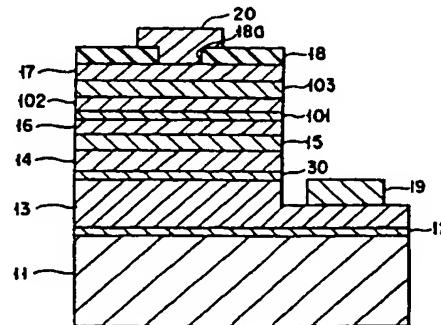


FIG. 2



**European Patent
Office**

EUROPEAN SEARCH REPORT

Application Number

EP 96 11 7792

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 675 552 A (TOYODA GOSEI KK) 4 October 1995 * abstract * * column 2, line 38-42 * ---	52	H01L33/00 H01S3/19
E	US 5 646 953 A (NAITO HIROKI ET AL) 8 July 1997 * column 8, line 13 - column 11, line 41 * * column 21, line 18 - column 23, line 24 *	1,14,52	
A	US 4 862 471 A (PANKOVE JACQUES I) 29 August 1989 * the whole document * ---	1-4,8, 14-17, 32-35,48	
D,A	PATENT ABSTRACTS OF JAPAN vol. 018, no. 225 (E-1541), 22 April 1994 -& JP 06 021511 A (NIPPON TELEGR & TELEPH CORP), 28 January 1994 * abstract *	1,14,23, 32,44	
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 124 (E-1183), 30 March 1992 -& JP 03 290984 A (MATSUSHITA ELECTRON CORP), 20 December 1991 * abstract *	1-4, 8-17, 21-26, 30-35, 39-43	H01L
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 567 (E-1296), 8 December 1992 -& JP 04 218994 A (TOSHIBA CORP), 10 August 1992 * abstract *	1,14	
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	11 September 1998	De Laere, A	
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone	T : theory or principle underlying the invention		
Y : particularly relevant if combined with another document of the same category	E : earlier patent document, but published on, or after the filing date		
A : technological background	D : document cited in the application		
O : non-written disclosure	L : document cited for other reasons		
P : intermediate document	& : member of the same patent family, corresponding document		